# Intra-segmental timing in sound change: /aw/ in Philadelphia

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## Intro

### Philadelphia (Labov et al 2013)

date of birth

1900 – 1950: /aw/ raising and fronting

1950 – today: /aw/ lowering and backing

Assumes /aw/is a 2-part diphthong.

Only describes the movement of the "nucleus" of the diphthong.

### Formant Trajectories

Have been investigated with generation as a categorical variable. Jacewicz, Fox & Salmons (2011)

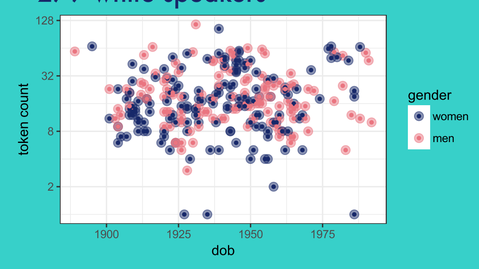
Wholistic measures compared against continuous variables. Risdal & Kohn (2014)

With GAMs, it is possible to model trajectories against continuous variables. Wood (2006)

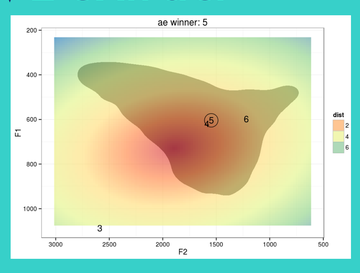
## Methods

### Data

Philadelphia Neighborhood Corpus
19,517 tokens of pre-oral /aw/
279 white speakers



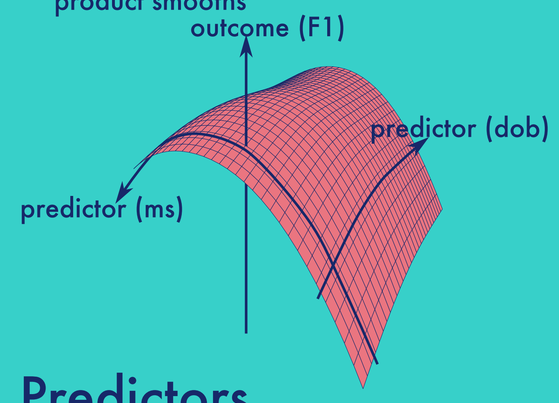

### FAVE-extract




Full formant tracks extracted
Subsampled to 20 measurements per token

### Modelling

Generalized additive models & tensor product smooths




### Predictors

All non-linear effects and interactions between
- gender
- date of birth
- log2(duration)
- measurement point

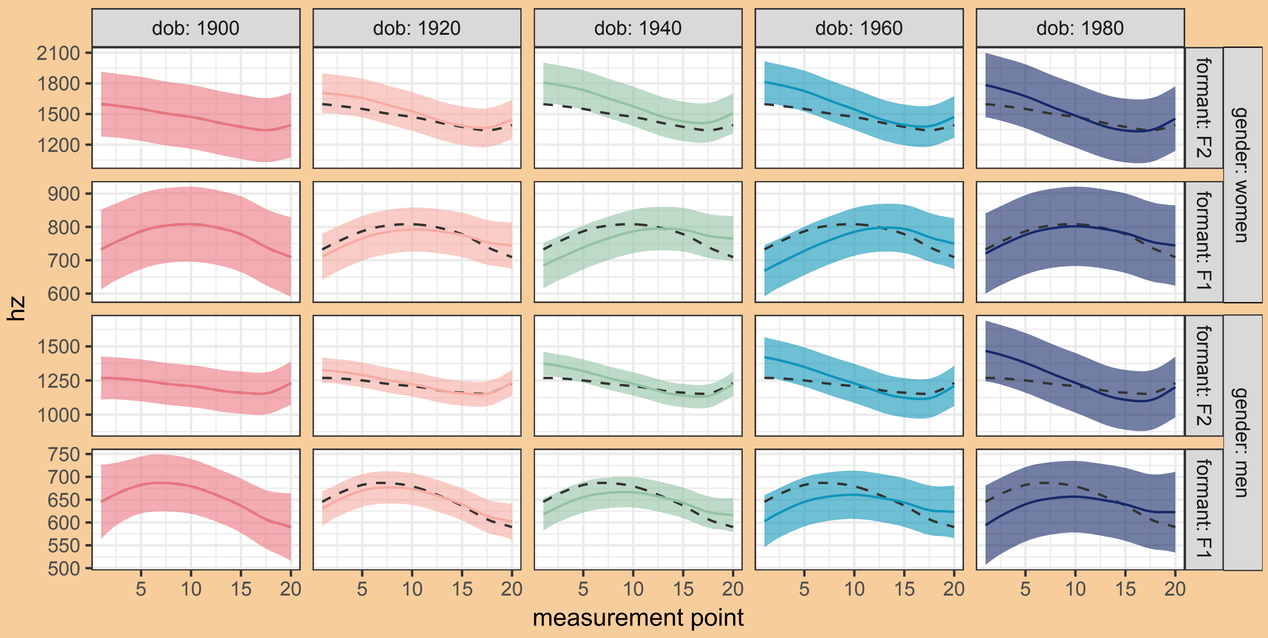
Random intercepts
-speaker
-word

Random smooths
-measurement point by speaker

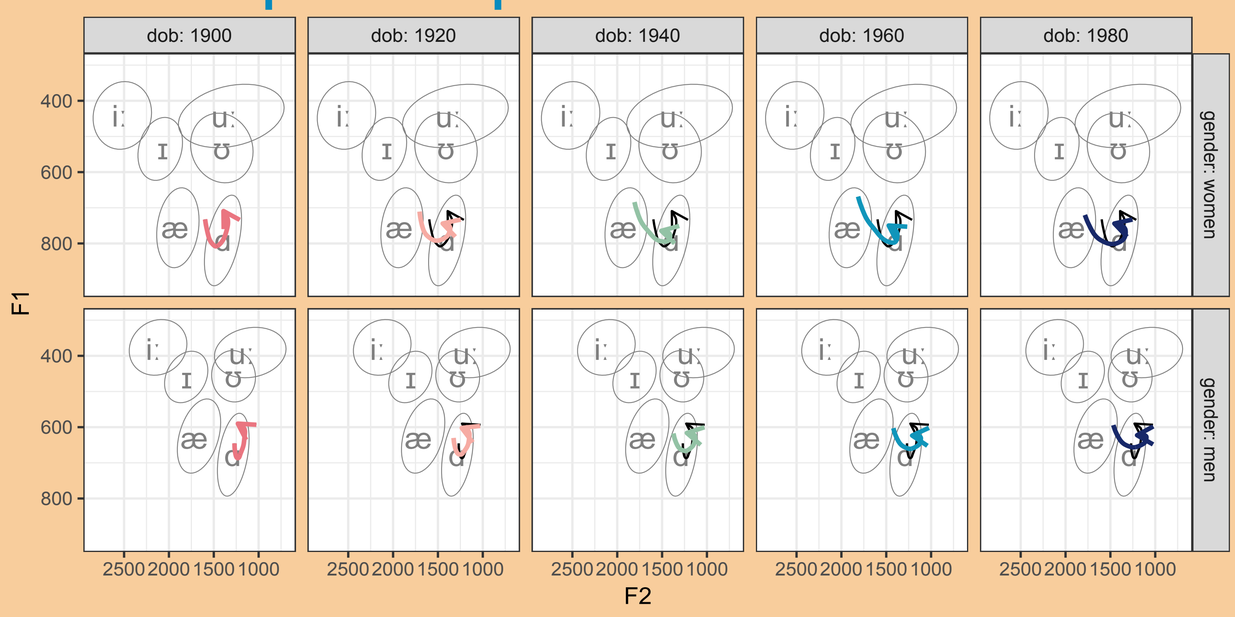
## Results

### formant tracks

falling F2 & single F1 excursion at midpoint (diphthong?)

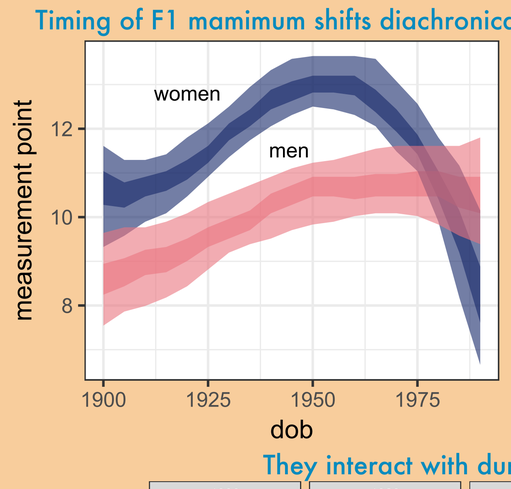



### vowel space trajectories

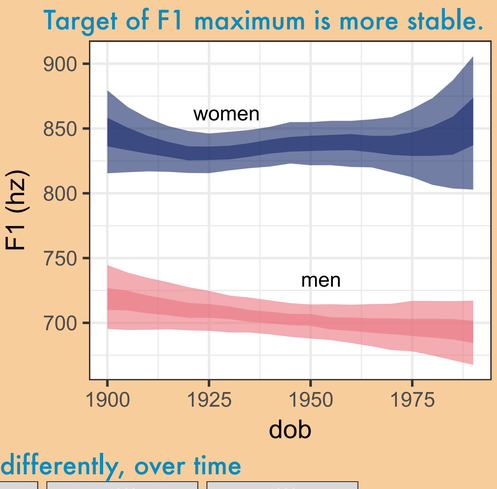



## max F1 excursion

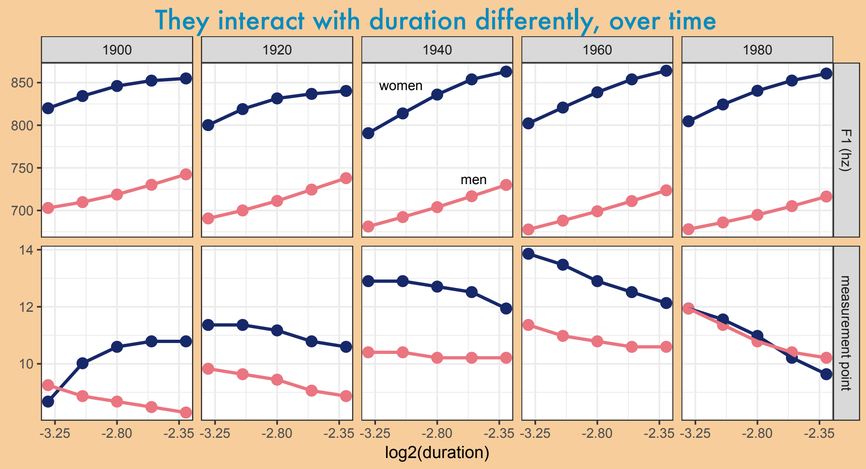
Timing of F1 mamimum shifts diachronically




Target of F1 maximum is more stable.

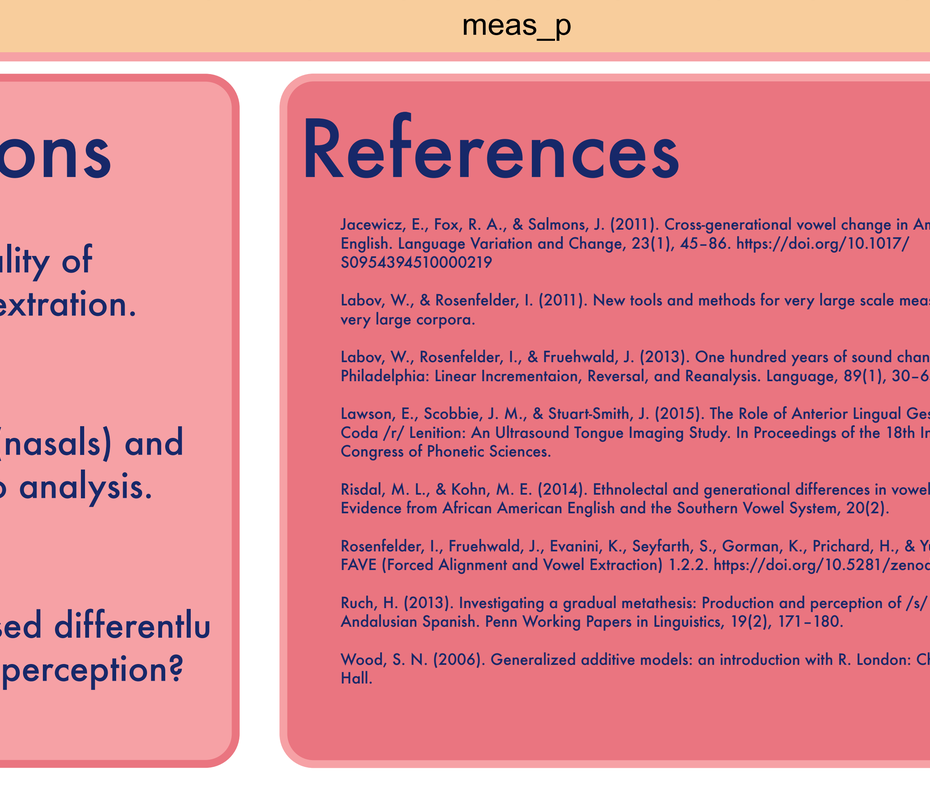



They interact with duration differently, over time




## F1 relative to F2

Delayed F1 maximum keeps F2/F1 difference larger for longer.




## Conclusion

It is not straightforward to characterize /aw/ as a 2 part diphthong in Philadelphia.

Along with the shifts in vowel quality, there is a considerable shift in relative timing of vowel formant targets.

This puts /aw/ in line with some consonantal phonetic changes, such as Scottish derhoticization or Andalusian post-aspiration.

## Further directions

Evaluating and improving quality of automated full formant track extration.

Incorporating more linguistic (nasals) and social (education) factors into analysis.

Are the F1 and F2 qualities used differentlu for linguistic or sociolinguistic perception?

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